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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/785,067

02/25/2004

Eun Joo Jang

6661-000039/US

8930

30593

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08/24/2006

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EXAMINER

NOVACEK, CHRISTY L

ART UNIT

PAPER NUMBER

2822

DATE MAILED: 08/24/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/785,067

Applicant(s)

JANG ET AL.

Examiner

Christy L. Novacek

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 09 August 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

This office action is in response to the request for continued examination filed August 9, 2006 and the amendment filed June 9, 2006.

#### ***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on June 9, 2006 has been entered.

#### ***Response to Amendment***

The limitations added to claims 1 and 15 are sufficient to overcome the rejections of claims 1, 3, 4, 10-13, 15 and 16 under 35 U.S.C. 102(e) as being anticipated by Simpson et al. (US 6,853,669).

#### ***Specification***

The amendment filed June 9, 2006 is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: "A semiconductor nanocrystal with a metal-exposed surface, may be maintained in a stable state by the bonds created between the nanocrystals surface and surfactants (e.g., organic ligands from the solvent) and the exposed metal" and "Some of the surfactants may donate electrons to the exposed metal reducing the

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electronic state of the metal” and “Other surfactants may be removed by a reducing agent causing the exposed metal to be converted to a metal oxide”. Original claims 5 and 15 only provide support for the limitations of forming a semiconductor nanocrystals having an oxidized surface.

Applicant is required to cancel the new matter in the reply to this Office Action.

***Claim Rejections - 35 USC § 103***

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dutta (US 6,906,339, previously cited) in view of Rockenberger et al. (US 6,878,184, previously cited).

Regarding claims 1, 13 and 15, Dutta discloses surface-treating semiconductor nanocrystals with a reducing agent (col. 4, ln. 29-62). Dutta does not disclose that the nanocrystals are coordinated by an organic dispersant. Like Dutta, Rockenberger discloses forming nanocrystals. Rockenberger teaches that it is advantageous to form the nanocrystals such that they are coordinated by an organic dispersant of carboxylic acid, such as oleic acid, and dispersing the nanocrystals in a solvent having an affinity with the dispersant because the dispersant can control the size and solubility of the nanocrystals (col. 3, ln. 1-39). At the time of the invention, it would have been obvious to one of ordinary skill in the art to form the nanocrystals such that they are coordinated by an organic dispersant of carboxylic acid, such as oleic acid, because the dispersant can control the size and solubility of the nanocrystals.

Regarding claim 2, Dutta discloses that the semiconductor nanocrystals are synthesized by a wet chemistry method (col. 5, ln. 35-45).

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Regarding claim 3, Dutta discloses that the semiconductor nanocrystals can be core-shell nanocrystals made of CdS, ZnS, CdSe, ZnSe, ZnTe, CdTe, GaN, GaP, InP or InAs (col. 4, ln. 29-41).

Regarding claim 4, Dutta discloses that the reducing agent can be a solution containing a reducing gas (col. 4, ln. 42-55; col. 7, ln. 35-45).

Regarding claims 5-7, 17 and 18 Dutta does not disclose that the nanocrystals are coordinated by an organic dispersant and dispersing the nanocrystals in a solvent having an affinity with the dispersant. Like Dutta, Rockenberger discloses forming nanocrystals. Rockenberger teaches that it is advantageous to form the nanocrystals such that they are coordinated by an organic dispersant of carboxylic acid, such as oleic acid, and dispersing the nanocrystals in a solvent having an affinity with the dispersant because the dispersant can control the size and solubility of the nanocrystals (col. 3, ln. 1-39). At the time of the invention, it would have been obvious to one of ordinary skill in the art to form the nanocrystals such that they are coordinated by an organic dispersant of carboxylic acid, such as oleic acid, and dispersing the nanocrystals in a solvent having an affinity with the dispersant because the dispersant can control the size and solubility of the nanocrystals.

Regarding claim 8, Dutta does not disclose the ratio at which the nanocrystals and reducing agent are mixed. At the time of the invention, it would have been obvious to one of ordinary skill in the art to use routine experimentation to determine an optimal nanocrystals to reducing agent ratio of the mixture of Dutta, depending upon the material of the nanocrystal and material of the reducing agent because such variables of art recognized importance are subject to

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routine experimentation and discovery of an optimum value for such variables is obvious. See *In re Aller*, 105 USPQ 233 (CCPA 1955).

Regarding claim 9, Dutta discloses that the surface treatment of the nanocrystals can be carried out at 0-100°C (col. 7, ln. 67).

Regarding claim 10, Dutta does not disclose the time period for which the surface-treatment of the nanocrystals is carried out. At the time of the invention, it would have been obvious to one of ordinary skill in the art to use routine experimentation to determine an optimal time period for which to carry out the surface treatment of the nanocrystals of Dutta, depending upon the material of the nanocrystal and material of the reducing agent because such variables of art recognized importance are subject to routine experimentation and discovery of an optimum value for such variables is obvious. See *In re Aller*, 105 USPQ 233 (CCPA 1955).

Regarding claim 11, Dutta disclose that the nanocrystals can have a spherical shape (Fig. 1).

Regarding claim 12, Dutta discloses that the nanocrystals can have a size of 2-100 nm (col. 4, ln. 10-20).

Regarding claim 14, Dutta discloses that the semiconductor nanocrystals may be incorporated into a luminescent layer in an organic electroluminescent device, an OLED, which inherently includes a plurality of organic and inorganic layers (col. 12, ln. 32-48).

Regarding claim 16, Dutta discloses that the reducing agent can be hydrogen sulfide or ammonia (col. 4, ln. 42-55; col. 7, ln. 35-45).

### ***Response to Arguments***

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Applicants arguments filed June 9, 2006 have been fully considered but they are not persuasive. Regarding the rejection of claim 5 as being unpatentable over Dutta in view of Rockenberger, Applicant argues that Dutta allegedly teaches away from “nanocrystals being coordinated by an organic dispersant”. Dutta discloses that the reactants may include organic compounds (col. 7, ln. 42-46), the solvent may made of a material other than water, depending upon the reaction and the by-products that must be dissolved (col. 9, ln. 20-22) and storing the nanocrystals in an organic solvent (col. 9, ln. 42-46). Therefore, Dutta does not teach away from using an organic dispersant. The motivation for combining the Dutta and Rockenberger references is that Rockenberger teaches that it is advantageous to form the nanocrystals such that they are coordinated by an organic dispersant of carboxylic acid, such as oleic acid, and dispersing the nanocrystals in a solvent having an affinity with the dispersant because the dispersant can control the size and solubility of the nanocrystals (col. 3, ln. 1-39).

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christy L. Novacek whose telephone number is (571) 272-1839. The examiner can normally be reached on Monday-Thursday and alternate Fridays 7:30 - 5:00.

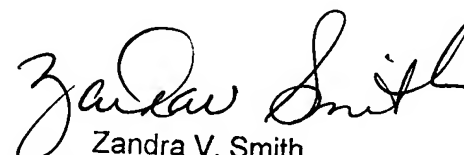
If attempts to reach the examiner by telephone are unsuccessful, the examiner’s supervisor, Zandra Smith can be reached on (571) 272-2429. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

CLN

August 21, 2006

  
Zandra V. Smith  
Supervisory Patent Examiner  
21 Aug. 2006